NORTH COAST WATERSHED AND FISHERY IMPROVEMENT PROGRAM

STREAM INVENTORY REPORT

Right Bank Tributary One to Martin Creek, Big River, 2002

CALIFORNIA DEPARTMENT OF FISH AND GAME

2003

Northern California-North Coast Region

STREAM INVENTORY REPORT

Right Bank Tributary One to Martin Creek

INTRODUCTION

A stream inventory was conducted beginning July 24 and ending July 25, 2002 on Right Bank Tributary One to Martin Creek. The survey began at the confluence with Martin Creek and extended upstream 1.47 miles.

The Right Bank Tributary One to Martin Creek inventory was conducted in two parts: habitat inventory and biological inventory. The objective of the habitat inventory was to document the habitat available to anadromous salmonids in Right Bank Tributary One to Martin Creek. The objective of the biological inventory was to document the presence and distribution of juvenile salmonid species.

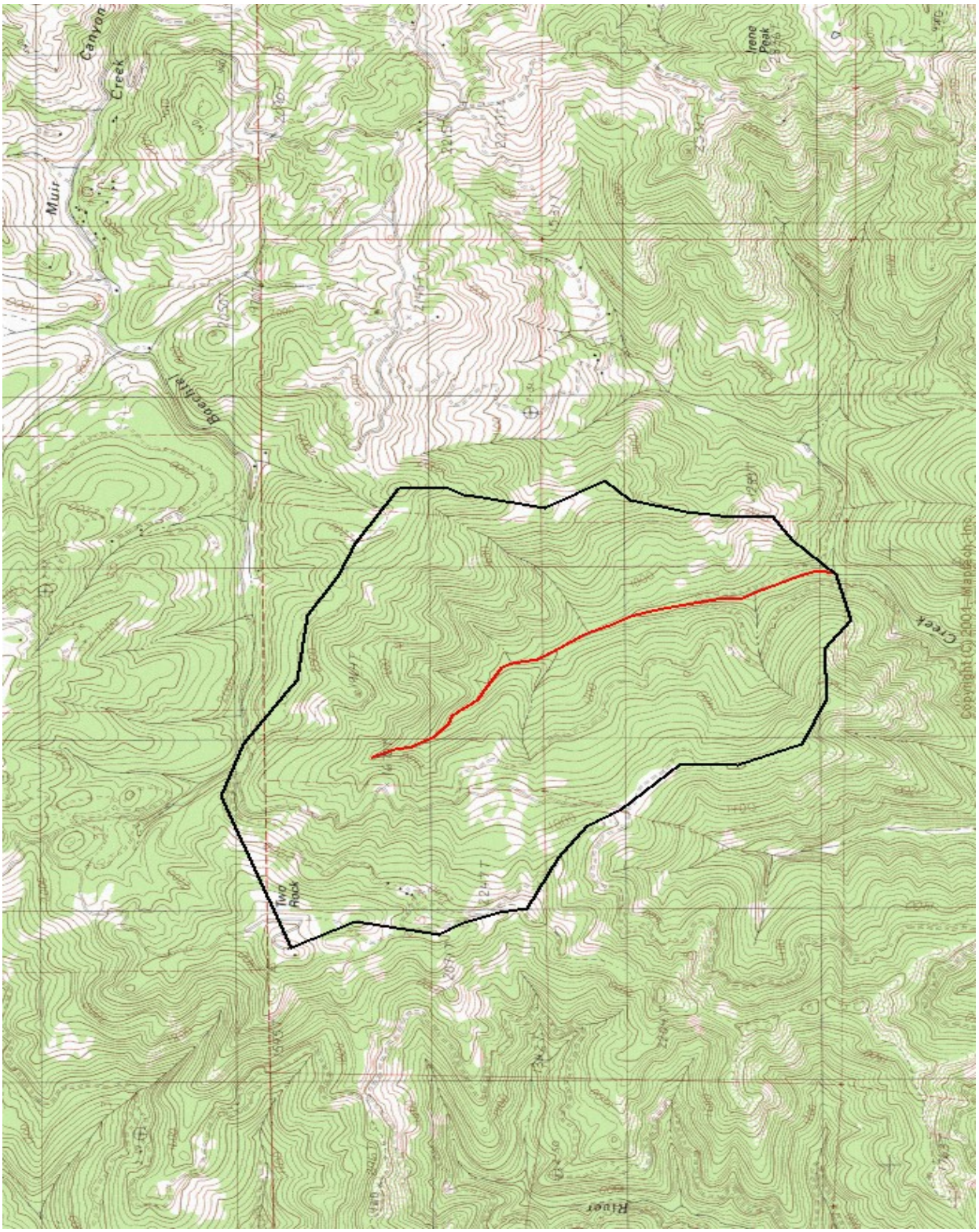
The objective of this report is to document the current habitat conditions and recommend options for the potential enhancement of habitat for coho salmon, and steelhead trout. Recommendations for habitat improvement activities are based upon target habitat values suitable for salmonids in California's north coast streams.

WATERSHED OVERVIEW

Right Bank Tributary One is a tributary to Martin Creek, a tributary to Big River, located in Mendocino County, California (Map 1). Right Bank Tributary One to Martin Creek's legal description at the confluence is T17N R14W S9. Its location is 39°20′10″ North latitude and 123 °25′5″ West longitude. Right Bank Tributary One to Martin Creek is a first order stream and has approximately 1.7 miles of solid blue line stream according to the USGS Greenough Ridge 7.5 minute quadrangle. Right Bank Tributary One to Martin Creek drains a watershed of approximately 2.2 square miles. Elevations range from about 720 feet at the mouth of the creek to 1400 feet in the headwater areas. Mixed conifer forest dominates the watershed. The watershed is entirely privately owned and is managed for timber production. Vehicle access exists via Highway 20 at mile marker 27. Pioneer Resources Timber Company's logging roads were used to reach the tributary.

METHODS

The habitat inventory conducted in Right Bank Tributary One to Martin Creek follows the methodology presented in the *California Salmonid Stream Habitat Restoration Manual* (Flosi et al, 1998). The California Department of Fish and Game Scientific Aids (DFG) and Watershed



MAP 1. RIGHT BANK TRIBUTARY ONE TO MARTIN CREEK.

Stewards Project/AmeriCorps (WSP/AmeriCorps) Members that conducted the inventory were trained in standardized habitat inventory methods by the California Department of Fish and Game (DFG). This inventory was conducted by a two-person team.

SAMPLING STRATEGY

The inventory uses a method that samples approximately 10% of the habitat units within the survey reach. All habitat units included in the survey are classified according to habitat type and their lengths are measured. All pool units are measured for maximum depth, depth of pool tail crest (measured in the thalweg), dominant substrate composing the pool tail crest, and embeddedness. Habitat unit types encountered for the first time are measured for all the parameters and characteristics on the field form. Additionally, from the ten habitat units on each field form page, one is randomly selected for complete measurement.

HABITAT INVENTORY COMPONENTS

A standardized habitat inventory form has been developed for use in California stream surveys and can be found in the *California Salmonid Stream Habitat Restoration Manual*. This form was used in Right Bank Tributary One to Martin Creek to record measurements and observations. There are nine components to the inventory form. For specific information on the methods used see the Martin Creek report**.**

BIOLOGICAL INVENTORY

Biological sampling during the stream inventory is used to determine fish species and their distribution in the stream. Fish presence was observed from the stream banks in Right Bank Tributary One to Martin Creek. These sampling techniques are discussed in the *California Salmonid Stream Habitat Restoration Manual*.

DATA ANALYSIS

Data from the habitat inventory form are entered into Habitat 8.4, a dBASE 4.2 data entry program developed by Tim Curtis, Inland Fisheries Division, California Department of Fish and Game. This program processes and summarizes the data, and produces the following six tables:

- Riffle, flatwater, and pool habitat types
- Habitat types and measured parameters
- Pool types

- Maximum pool depths by habitat types
- Dominant substrates by habitat types
- Mean percent shelter by habitat types

Graphics are produced from the tables using Excel. Graphics developed for Right Bank Tributary One to Martin Creek include:

- Riffle, flatwater, pool habitats by percent occurrence
- Riffle, flatwater, pool habitats by total length
- Total habitat types by percent occurrence
- Pool types by percent occurrence
- Total pools by maximum depths
- Embeddedness
- Pool cover by cover type
- Dominant substrate in low gradient riffles
- Mean percent canopy
- Bank composition by composition type
- Bank vegetation by vegetation type

HABITAT INVENTORY RESULTS

* ALL TABLES AND GRAPHS ARE LOCATED AT THE END OF THE REPORT *

The habitat inventory of July 24 through 25, 2002, was conducted by Kate Grossman (WSP) and Kristi Knechtle (DFG). The total length of the stream surveyed was 7,749 feet.

Stream flow was not measured on Right Bank Tributary One to Martin Creek.

Right Bank Tributary One to Martin Creek is a B3 channel type for the entire 7,749 of stream surveyed. B3 channel types are classified as moderately entrenched, moderate gradient, riffle dominated channels with infrequently spaced pools, very stable plan and profile, stable banks, and cobble-dominated substrate.

Water temperatures taken during the survey period ranged from 55 to 61 degrees Fahrenheit. Air temperatures ranged from 56 to 83 degrees Fahrenheit.

Table 1 summarizes the Level II riffle, flatwater, and pool habitat types. Based on frequency of occurrence there were 47% pool units, 31% flatwater units, 21% riffle units, and 1% dry units (Graph 1). Based on total length of Level II habitat types there were 70% flatwater units, 16% pool units, and 14% riffle units (Graph 2).

Twelve Level IV habitat types were identified (Table 2). The most frequent habitat types by percent occurrence were mid-channel pools, 29%; step runs, 29%; and low gradient riffles, 16% (Graph 3). Based on percent total length, step runs made up 68%, mid channel pools 10%, and low gradient riffles 9%.

A total of 56 pools were identified (Table 3). Main channel pools were the most frequently encountered, at 63%, and comprised 62% of the total length of all pools (Graph 4).

Table 4 is a summary of maximum pool depths by pool habitat types. Pool quality for salmonids increases with depth. Twelve of the 56 pools (21%) had a depth of two feet or greater (Graph 5).

The depth of cobble embeddedness was estimated at pool tail-outs. Of the 56 pool tail-outs measured, 6 had a value of 1 (11%); 11 had a value of 2 (20%); 21 had a value of 3 (38%); 3 had a value of 4 (23%); and 5 had a value of 5 (9%) (Graph 6). On this scale, a value of 1 indicates the highest quality of spawning substrate.

A shelter rating was calculated for each habitat unit and expressed as a mean value for each habitat type within the survey using a scale of 0-300. Pool habitats had a mean shelter rating of 26, flatwater habitat types had a mean shelter rating of 19, and riffle habitat types had a mean shelter rating of 5, (Table 1). Of the pool types, the scour pools had the highest mean shelter rating at 28. Main channel pools had a mean shelter rating of 25 (Table 3).

Table 5 summarizes mean percent cover by habitat type. Boulders are the dominant cover types in Right Bank Tributary One to Martin Creek. Graph 7 describes the pool cover in Right Bank Tributary One to Martin Creek. Boulders are the dominant pool cover type followed by small woody debris.

Table 6 summarizes the dominant substrate by habitat type. Graph 8 depicts the dominant substrate observed in pool tail-outs. Gravel was the dominant substrate observed in 46% of pool tail-outs while small cobble was the next most frequently observed substrate type, at 25%.

The mean percent canopy density for the surveyed length of Right Bank Tributary One to Martin Creek was 83%. The mean percentages of deciduous and coniferous trees were 10% and 90%, respectively. Graph 9 describes the mean percent canopy in Right Bank Tributary One to Martin Creek.

For the stream reach surveyed, the mean percent right bank vegetated was 68%. The mean percent left bank vegetated was 61%. The dominant elements composing the structure of the stream banks consisted of 48% sand/silt/clay, 26% cobble/gravel, 19% bedrock, and 7% boulder (Graph 10). Coniferous trees were the dominant vegetation type observed in 57% of the units surveyed. Additionally, 40% of the units surveyed had brush as the dominant vegetation type (Graph 11).

BIOLOGICAL INVENTORY RESULTS

Young of year salmonids were detected using streambank observation techniques during the Right Bank Tributary One to Martin Creek stream survey.

DISCUSSION

Right Bank Tributary One to Martin Creek is a B3 channel type for the entire 7,749 feet of stream surveyed. The suitability of B3 channel type for fish habitat improvement structures is as follows: B3 channel types are excellent for plunge weirs, boulder clusters and bank placed boulders, single and opposing wing deflectors, and log cover

The water temperatures recorded on the survey days July 24, through July 25, 2002 ranged from 55 to 61 degrees Fahrenheit. Air temperatures ranged from 56 to 83 degrees Fahrenheit. This is a suitable water temperature range for salmonids. However, 60° F, if sustained, is near the threshold stress level for salmonids. To make any further conclusions, temperatures would need to be monitored throughout the warm summer months, and more extensive biological sampling would need to be conducted.

Flatwater habitat types comprised 70% of the total length of this survey, riffles 14%, and pools 26%. The pools are relatively shallow, with 12 of the 56 (21%) pools having a maximum depth greater than 2 feet. In general, pool enhancement projects are considered when primary pools comprise less than 40% of the length of total stream habitat. In first and second order streams, a primary pool is defined to have a maximum depth of at least two feet, occupy at least half the width of the low flow channel, and be as long as the low flow channel width. Installing structures that will increase or deepen pool habitat is recommended for locations where their installation will not be threatened by high stream energy, or where their installation will not conflict with the modification of the numerous log debris accumulations (LDA's) in the stream.

Seventeen of the 56 pool tail-outs measured had embeddedness ratings of 1 or 2. Thirty-four of the pool tail-outs had embeddedness ratings of 3 or 4. Five of the pool tail-outs had a rating of 5, which is considered unsuitable for spawning. Cobble embeddedness measured to be 25% or less, a rating of 1, is considered to indicate good quality spawning substrate for salmon and steelhead. Sediment sources in Right Bank Tributary One to Martin Creek should be mapped and rated according to their potential sediment yields, and control measures should be taken.

Forty of the 56 pool tail-outs measured had gravel and small cobble as the dominant substrate. This is generally considered good for spawning salmonids.

The mean shelter rating for pools was 26. The shelter rating in the flatwater habitats was 19. A

pool shelter rating of approximately 100 is desirable. The amount of cover that now exists is being provided primarily by boulders in all habitat types. Additionally, small woody debris contributes a small amount. Log and root wad cover structures in the pool and flatwater habitats would enhance both summer and winter salmonid habitat. Log cover structure provides rearing fry with protection from predation, rest from water velocity, and also divides territorial units to reduce density related competition.

The mean percent canopy density for the stream was 83%. In general, revegetation projects are considered when canopy density is less than 80%.

The percentage of right and left bank covered with vegetation was moderate at 68% and 61%, respectively. In areas of stream bank erosion or where bank vegetation is not at acceptable levels, planting endemic species of coniferous and deciduous trees, in conjunction with bank stabilization, is recommended.

RECOMMENDATIONS

1) Right Bank Tributary One to Martin Creek should be managed as an anadromous, natural production stream.

2) The limited water temperature data available suggest that maximum temperatures are within the suitable range for juvenile salmonids. To establish more complete and meaningful temperature regime information, 24-hour monitoring during the July and August temperature extreme period should be performed for 3 to 5 years.

3) Where feasible, design and engineer pool enhancement structures to increase the number of pools. This must be done where the banks are stable or in conjunction with stream bank armor to prevent erosion.

4) Increase woody cover in the pools and flatwater habitat units. Much of the existing cover is from boulders. Adding high quality complexity with log and root wad cover is desirable.

5) Inventory and map sources of stream bank erosion and prioritize them according to present and potential sediment yield. Identified sites should then be treated to reduce the amount of fine sediments entering the stream.

6) Active and potential sediment sources related to the road system need to be identified, mapped, and treated according to their potential for sediment yield to the stream and its tributaries.

7) Increase the canopy on Right Bank Tributary One to Martin Creek by planting willow, alder, redwood, and Douglas fir along the stream where shade canopy is not at acceptable levels. The reaches above this survey section should be inventoried and treated as well, since the water flowing here is affected from upstream. In many cases, planting will need to be coordinated to follow bank stabilization or upslope erosion control projects.

8) Suitable size spawning substrate on Right Bank Tributary One to Martin Creek is limited to relatively few reaches. Projects should be designed at suitable sites to trap and sort spawning gravel.

9) There are several log debris accumulations present on Right Bank Tributary One to Martin Creek that are retaining large quantities of fine sediment. The modification of these debris accumulations is desirable, but must be done carefully, over time, to avoid excessive sediment loading in downstream reaches.

10) Due to the high gradient of the stream, access for migrating salmonids is an ongoing potential problem. Good water temperature and flow regimes exist in the stream and it offers good conditions for rearing fish. Fish passage should be monitored and improved where possible.

COMMENTS AND LANDMARKS

The following landmarks and possible problem sites were noted. All distances are approximate and taken from the beginning of the survey reach.

0'	BEGIN SURVEY 80 FEET FROM CONFLUENCE WITH MARTIN CREEK. B3 CHANNEL.
25'	SALMONIDS PRESENT.
49'	SINGLE PIECE OF LARGE WOODY DEBRIS (LWD) HELPING WITH SCOUR.
327'	LOG CREATED SCOUR GREATER THAN 60%. STEELHEAD AND COHO YOUNG OF YEAR (YOY) IN POOL.
648'	LWD PILE WITH SMALL WOODY DEBRIS (SWD) AT TOP. 15 FEET WIDE AND 8 FEET TALL, TRAPPING FINES AND SUBSTRATE AT TOP. WATER SEEPING THROUGH GRAVEL POTENTIAL BARRIER FOR OUT MIGRATING SALMONIDS.
725'	STEELHEAD YEARLING AND YOY.
781'	COHO AND STEELHEAD YOY. LWD WITH SWD PILE AT TOP 25 FEET WIDE AND 4 FEET HIGH TRAPPING SUBSTRATE. POTENTIAL DOWN STREAM BARRIER IN SUMMER.
1059'	DRY LEFT BANK TRIB.

1163' SINGLE PIECE OF LWD ABOUT 40 FEET LONG.

1459' DRY LEFT BANK TRIB IN THIS UNIT.

1633' STEELHEAD YEARLING.

1932' RIGHT BANK TRIBUTARY. NO FISH WERE OBSERVED.

2297' DIRT RECENTLY MOVED ON BOTH RIGHT AND LEFT BANKS. POSSIBLY OLD WET CROSSING? NEXT TO ROAD. OLD NARROW GAUGE RR TRACKS IN CHANNEL.

2457' 5 TO 10 COHO YOY. WOOD PILE AT TOP OF POOL TRAPPING SUBSTRATE. POTENTIAL FUTURE ISSUE.

2479' DRY 1' DIA. CULVERT ON THE LEFT BANK.

2912' LWD PILE WITH SWD AT TOP OF POOL. 8 FEET HIGH AND 20 FEET WIDE.

3060' BRIDGE CROSSING STREAM. OLD HUMBOLDT CROSSING CONVERTED INTO A BRIDGE.

3198' 2 PIECES OF LWD HELPING WITH SCOUR.

3307' STEELHEAD YEARLING.

3327' CHANNEL TYPE TAKEN.

3386' DRY LEFT BANK TRIBUTARY.

3507' SCULPIN.

3686' EVIDENCE OF OLD LOGGING ROAD ON RIGHT BANK. LOGS ALONG BANK.

3997' COHO YOY IN POOL. LAYER OF SEDIMENT ON SUBSTRATE OF POOL. PILE OF SAND/FINES. 5 FOOT ELEVATION CHANGE ON TOP OF LWD AND SWD PLE. POTENTIAL BARRIER TO DOWN MIGRATING FISH.

4213' DRY LEFT BANK TRIBUTARY.

4310' DRY RIGHT BANK TRIBUTARY

4515' LWD PILE ON LEFT BANK 40 FEET WIDE, 15 FEET LONG, AND 7 FEET HIGH.

4984' FLOWING LEFT BANK TRIBUTARY.

5347' UNIIDENTIFIED FROG. RIGHT BANK TRIBUTARY. MANY ORANGE DANGER FLAGS WITH SKULL AND CROSS BONES HANGING ALONG THIS TRIBUTARY. POSSIBLE TAN OAK SLASH AND SQUIRT.

5476' LEFT BANK EROSION ABOUT 20 FEET LONG AND 8 FEET HIGH.

5513' LEFT BANK EROSION 50 FEET HIGH AND 10 FEET WIDE.

5653'	LWD PILE WITH SWD 15 FEET HIGH, 20 FEET LONG AND 20 FEET WIDE.
5745'	10 FOOT ELEVATION CHANGE WITH PLUNGE.
5782'	LWD WITH SWD AT TOP OF UNIT. 5 FOOT DROP FROM PLUNGE SEDIMENT PILED AT TOP OF LWD.
5855'	RIGHT BANK TRIBUTARY WITH WATER.
6192'	LWD WITH SWD TRAPPING FINE SEDIMENTS AT TOP. WATER SEEPING THROUGH.
6524'	LEFT BANK TRIBUTARY. SEEPING WATER.
6982'	1 STEELHEAD YOY.
7041'	LEFT BANK TRIBUTARY. 3 FOOT PLUNGE INTO POOL WITH COBBLE PILED AT TOP.
7053'	LWD PILE. 15 PIECES OF LWD WITH SWD AND ROOTWAD. POTENTIAL BARRIER.
7349'	2 SALAMANDERS.
7469'	STEP RUN WITH INCREASING GRADIENT.
7600'	STEP RUN WITH INCREASING GRADIENT.
7738'	END OF SURVEY - THE SURVEY WAS ENDED DUE TO THE CONTINUED INCREASE IN GRADIENT; MULTIPLE LWD PILES IN THE CHANNEL; AND LACK OF FISH. THE STREAM WAS WALKED FOR AN ADDITIONAL 800 FEET. THERE WERE MANY MORE LWD PILES WITH SUBSTRATE PILES.

REFERENCES

Flosi, G., Downie, S., Hopelain, J., Bird, M., Coey, R., and Collins, B. 1998. *California Salmonid Stream Habitat Restoration Manual*, 3rd edition. California Department of Fish and Game, Sacramento, California.

LEVEL III and LEVEL IV HABITAT TYPES

RIFFLE			
Low Gradient Riffle	(LGR)	[1.1]	{ 1}
High Gradient Riffle	(HGR)	[1.2]	{ 2}
CASCADE			
Cascade	(CAS)	[2.1]	{ 3}
Bedrock Sheet	(BRS)	[2.2]	{24}
FLATWATER			
Pocket Water	(POW)	[3.1]	{21}
Glide	(GLD)	[3.2]	{14}
Run	(RUN)	[3.3]	{15}
Step Run	(SRN)	[3.4]	{16}
Edgewater	(EDW)	[3.5]	{18}
MAIN CHANNEL POOLS			
Trench Pool	(TRP)	[4.1]	{ 8}
Mid-Channel Pool	(MCP)	[4.2]	{17}
Channel Confluence Pool	(CCP)	[4.3]	{19}
Step Pool	(STP)	[4.4]	{23}
SCOUR POOLS			
Corner Pool	(CRP)	[5.1]	{22}
Lateral Scour Pool - Log Enhanced	(LSL)	[5.2]	{10}
Lateral Scour Pool - Root Wad Enhanced	(LSR)	[5.3]	{11}
Lateral Scour Pool - Bedrock Formed	(LSBk)	[5.4]	{12}
Lateral Scour Pool - Boulder Formed	(LSBo)	[5.5]	{20}
Plunge Pool	(PLP)	[5.6]	{ 9}
BACKWATER POOLS			
Secondary Channel Pool	(SCP)	[6.1]	{ 4}
Backwater Pool - Boulder Formed	(BPB)	[6.2]	{ 5}
Backwater Pool - Root Wad Formed	(BPR)	[6.3]	{ 6}
Backwater Pool - Log Formed	(BPL)	[6.4]	{ 7}
Dammed Pool	(DPL)	[6.5]	{13}
ADDITIONAL UNIT DESIGNATIONS			
Dry	(DRY)	[7.0]	
Culvert	(CUL)	[8.0]	
Not Surveyed	(NS)	[9.0]	
Not Surveyed due to a marsh	(MAR)	[9.1]	

TABLE 8. FISH HABITAT INVENTORY DATA SUMMARY

STREAM NAME: MRT_RB1
SAMPLE DATES: 07/24/02 to 07/25/02
STREAM LENGTH: 7749 ft.
LOCATION OF STREAM MOUTH:
USGS Quad Map: GREENOUGH — Latitude: 39°20'10"
Legal Description: T17NR14WS09 — Longitude: 123°25'5"

SUMMARY OF FISH HABITAT ELEMENTS BY STREAM REACH

STREAM REACH 01

Channel Type: B3	Canopy Density: 83%
Channel Length: 7749 ft.	Coniferous Component: 90%
Riffle/flatwater Mean Width: 7 ft.	Deciduous Component: 10%
Total Pool Mean Depth: 0.7 ft.	Pools by Stream Length: 16%
Base Flow: 0.0 cfs	Pools >=3 ft.deep: 5%
Water: 055- 061°F Air: 056-083°F	Mean Pool Shelter Rtn: 26
Dom. Bank Veg.: Coniferous Trees	Dom. Shelter: Boulders
Vegetative Cover: 64%	Occurrence of LOD: 14%
Dom. Bank Substrate: Silt/Clay/Sand	Dry Channel: 20 ft.

Embeddness Value: 1. 11% 2.20% 3. 38% 4. 23% 5. 9%

MRT_RB1 Drainage: MARTIN

Table 1 - SUMMARY OF RIFFLE, FLATWATER, AND POOL HABITAT TYPES Survey Dates: 07/24/02 to 07/25/02

Confluence Location: QUAD: GREENOUGH LEGAL DESCRIPTION: T17NR14WS09 LATITUDE:39°20'10" LONGITUDE:123°25'5"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	ESTIMATED TOTAL AREA (sq.ft.)	MEAN VOLUME (cu.ft.)	ESTIMATED TOTAL VOLUME (cu.ft.)	MEAN RESIDUAL POOL VOL (cu.ft.)	MEAN SHELTER RATING
25	3	RIFFLE	21	43	1073	14	8.0	0.2	118	2960	28	688	0	5
37	4	FLATWATER	31	147	5421	70	6.8	0.4	340	12586	119	4393	0	19
56	56	POOL	47	22	1235	16	7.5	0.7	166	9312	130	7263	87	26
1	0	DRY	1	20	20	0	0.0	0.0	0	0	0	0	0	0

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq. ft.)	TOTAL VOL. (cu. ft.)
119	63	7749	24858	12345

MRT_RB1 Drainage: MARTIN

Table 2 - SUMMARY OF HABITAT TYPES AND MEASURED PARAMETERS Survey Dates: 07/24/02 to 07/25/02

Confluence Location: QUAD: GREENOUGH LEGAL DESCRIPTION: T17NR14WS09 LATITUDE:39°20'10" LONGITUDE:123°25'5"

HABITAT UNITS #	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT OCCURRENCE %	MEAN LENGTH ft.	TOTAL LENGTH ft.	TOTAL LENGTH %	MEAN WIDTH ft.	MEAN DEPTH ft.	MAXIMUM DEPTH ft.	MEAN AREA sq.ft.	TOTAL AREA EST. sq.ft.	MEAN VOLUME cu.ft.	TOTAL VOLUME EST. cu.ft.	MEAN RESIDUAL POOL VOL cu.ft.	MEAN SHELTER RATING	MEAN CANOPY %
19	2	LGR	16	37	694	9	8	0.2	0.4	120	2280	24	456	0	5	81
6	1	HGR	5	63	379	5	8	0.3	0.5	115	691	35	208	0	5	92
3	1	RUN	3	44	131	2	10	0.3	0.1	344	1032	103	310	0	40	82
34	3	SRN	29	156	5290	68	6	0.4	0.9	339	11521	124	4213	0	12	83
34	34	MCP	29	22	757	10	8	0.7	3.4	180	6130	150	5088	100	25	79
1	1	STP	1	14	14	0	5	0.8	1.4	56	56	45	45	34	10	90
3	3	CRP	3	22	67	1	8	0.6	3.0	174	522	104	311	69	50	85
4	4	LSR	3	23	92	1	7	0.7	2.1	149	597	105	420	79	45	82
8	8	LSBk	7	21	171	2	6	0.6	1.6	133	1066	79	636	51	9	90
1	1	LSBo	1	41	41	1	7	0.7	1.7	287	287	201	201	144	40	85
5	5	PLP	4	19	93	1	7	0.8	2.5	131	655	112	562	76	29	88
1	0	DRY	1	20	20	0	0	0.0	0.0	0	0	0	0	0	0	0

TOTAL UNITS	TOTAL UNITS	LENGTH (ft.)	AREA (sq.ft)	TOTAL VOL. (cu.ft)
119	63	7749	24837	12449

MRT_RB1 Drainage: MARTIN

Table 3 - SUMMARY OF POOL TYPES Survey Dates: 07/24/02 to 07/25/02

Confluence Location: QUAD: GREENOUGH LEGAL DESCRIPTION: T17NR14WS09 LATITUDE:39°20'10" LONGITUDE:123°25'5"

HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	MEAN LENGTH (ft.)	TOTAL LENGTH (ft.)	PERCENT TOTAL LENGTH	MEAN WIDTH (ft.)	MEAN DEPTH (ft.)	MEAN AREA (sq.ft.)	TOTAL AREA EST. (sq.ft.)	MEAN VOLUME (cu.ft.)	TOTAL VOLUME EST. (cu.ft.)	MEAN RESIDUAL POOL VOL. (cu.ft.)	MEAN SHELTER RATING
35	35	MAIN	63	22	771	62	7.9	0.7	177	6186	147	5133	98	25
21	21	SCOUR	38	22	464	38	6.8	0.7	149	3127	101	2131	69	28

TOTAL UNITS	TOTAL UNITS	TOTAL LENGTH (ft.)	TOTAL AREA (sq.ft.)	TOTAL VOL. (cu.ft.)
56	56	1235	9312	7263

MRT_RB1 Drainage: MARTIN

Table 4 - SUMMARY OF MAXIMUM POOL DEPTHS BY POOL HABITAT TYPES Survey Dates: 07/24/02 to 07/25/02

Confluence Location: QUAD: GREENOUGH LEGAL DESCRIPTION: T17NR14WS09 LATITUDE:39°20'10" LONGITUDE:123°25'5"

UNITS MEASURED	HABITAT TYPE	HABITAT PERCENT OCCURRENCE	<1 FOOT MAXIMUM DEPTH	<1 FOOT PERCENT OCCURRENCE	1-<2 FT. MAXIMUM DEPTH	1-<2 FOOT PERCENT OCCURRENCE	2-<3 FT. MAXIMUM DEPTH	2-<3 FOOT PERCENT OCCURRENCE	3-<4 FT. MAXIMUM DEPTH	3-<4 FOOT PERCENT OCCURRENCE	>=4 FEET MAXIMUM DEPTH	>=4 FEET PERCENT OCCURRENCE
34	MCP	61	0	0	26	76	6	18	2	6	0	0
1	STP	2	0	0	1	100	0	0	0	0	0	0
3	CRP	5	0	0	2	67	0	0	1	33	0	0
4	LSR	7	0	0	3	75	1	25	0	0	0	0
8	LSBk	14	0	0	8	100	0	0	0	0	0	0
1	LSBo	2	0	0	1	100	0	0	0	0	0	0
5	PLP	9	0	0	3	60	2	40	0	0	0	0

TOTAL UNITS
56

MRT_RB1 Drainage: MARTIN

Table 5 - SUMMARY OF MEAN PERCENT COVER BY HABITAT TYPE Survey Dates: 07/24/02 to 07/25/02

Confluence Location: QUAD: GREENOUGH LEGAL DESCRIPTION: T17NR14WS09 LATITUDE:39°20'10" LONGITUDE:123°25'5"

UNITS MEASURED	UNITS FULLY MEASURED	HABITAT TYPE	MEAN % UNDERCUT BANKS	MEAN % SWD	MEAN % LWD	MEAN % ROOT MASS	MEAN % TERR. VEGETATION	MEAN % AQUATIC VEGETATION	MEAN % WHITE WATER	MEAN % BOULDERS	MEAN % BEDROCK LEDGES
19	2	LGR	0	20	0	5	5	0	0	60	10
6	1	HGR	0	10	0	0	0	0	40	50	0
3	1	RUN	0	30	50	0	0	0	0	20	0
34	3	SRN	10	22	7	3	0	0	7	52	0
34	34	MCP	12	18	17	7	1	0	4	38	3
1	1	STP	0	10	0	0	0	0	30	60	0
3	3	CRP	15	28	20	20	0	0	0	13	3
4	4	LSR	21	34	18	16	0	0	0	11	0
8	8	LSBk	0	19	5	0	0	0	1	39	36
1	1	LSBo	30	10	0	20	10	0	0	30	0
5	5	PLP	4	14	10	4	0	0	14	39	15
1	0	DRY	0	0	0	0	0	0	0	0	0

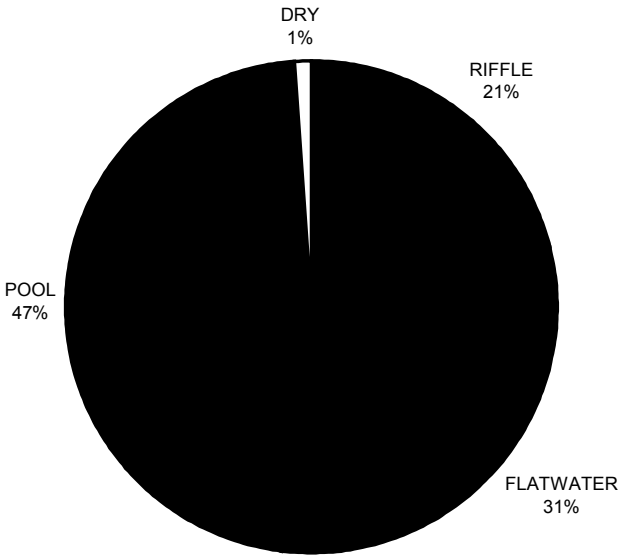
MRT_RB1 Drainage: MARTIN

Table 6 - SUMMARY OF DOMINANT SUBSTRATES BY HABITAT TYPE Survey Dates: 07/24/02 to 07/25/02

Confluence Location: QUAD: GREENOUGH LEGAL DESCRIPTION: T17NR14WS09 LATITUDE:39°20'10" LONGITUDE:123°25'5"

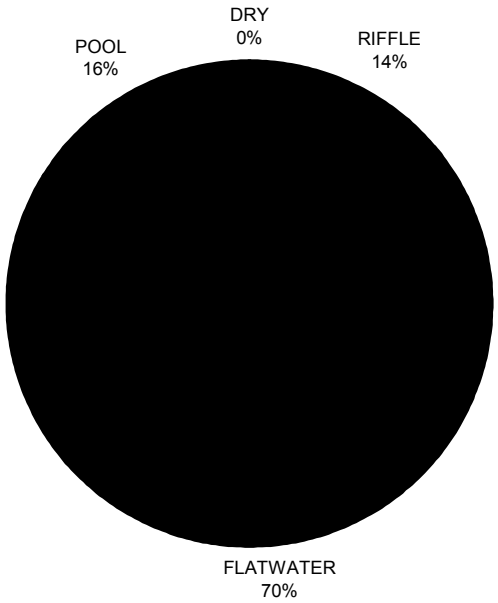
TOTAL HABITAT UNITS	UNITS FULLY MEASURED	HABITAT TYPE	% TOTAL SILT/CLAY DOMINANT	% TOTAL SAND DOMINANT	% TOTAL GRAVEL DOMINANT	% TOTAL SM COBBLE DOMINANT	% TOTAL LG COBBLE DOMINANT	% TOTAL BOULDER DOMINANT	% TOTAL BEDROCK DOMINANT
19	2	LGR	0	0	0	50	50	0	0
6	1	HGR	0	0	0	100	0	0	0
3	1	RUN	0	0	0	0	100	0	0
34	3	SRN	0	0	33	67	0	0	0
34	6	MCP	0	50	33	17	0	0	0
1	1	STP	0	0	0	0	100	0	0
3	1	CRP	0	0	0	100	0	0	0
4	1	LSR	0	0	0	0	100	0	0
8	2	LSBk	0	0	0	50	50	0	0
1	1	LSBo	0	0	0	100	0	0	0
5	2	PLP	0	0	50	50	0	0	0
1	0	DRY	0	0	0	0	0	0	0

RIGHT BANK TRIBUTARY 1 MARTIN CREEK
HABITAT TYPES BY PERCENT OCCURENCE



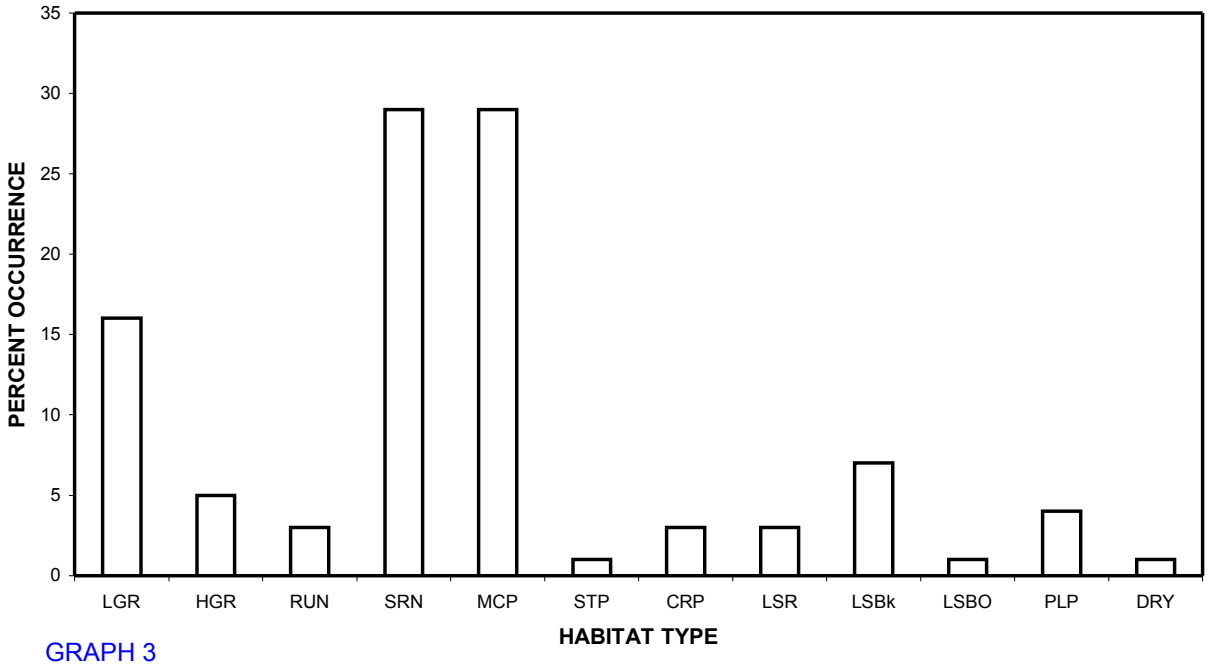
GRAPH 1

RIGHT BANK TRIBUTARY 1 MARTIN CREEK
HABITAT TYPES BY PERCENT TOTAL LENGTH



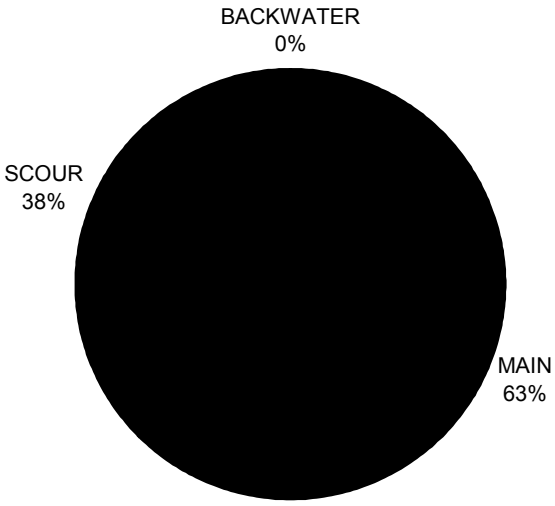
GRAPH 2

RIGHT BANK TRIBUTARY 1 MARTIN CREEK
HABITAT TYPES BY PERCENT OCCURRENCE



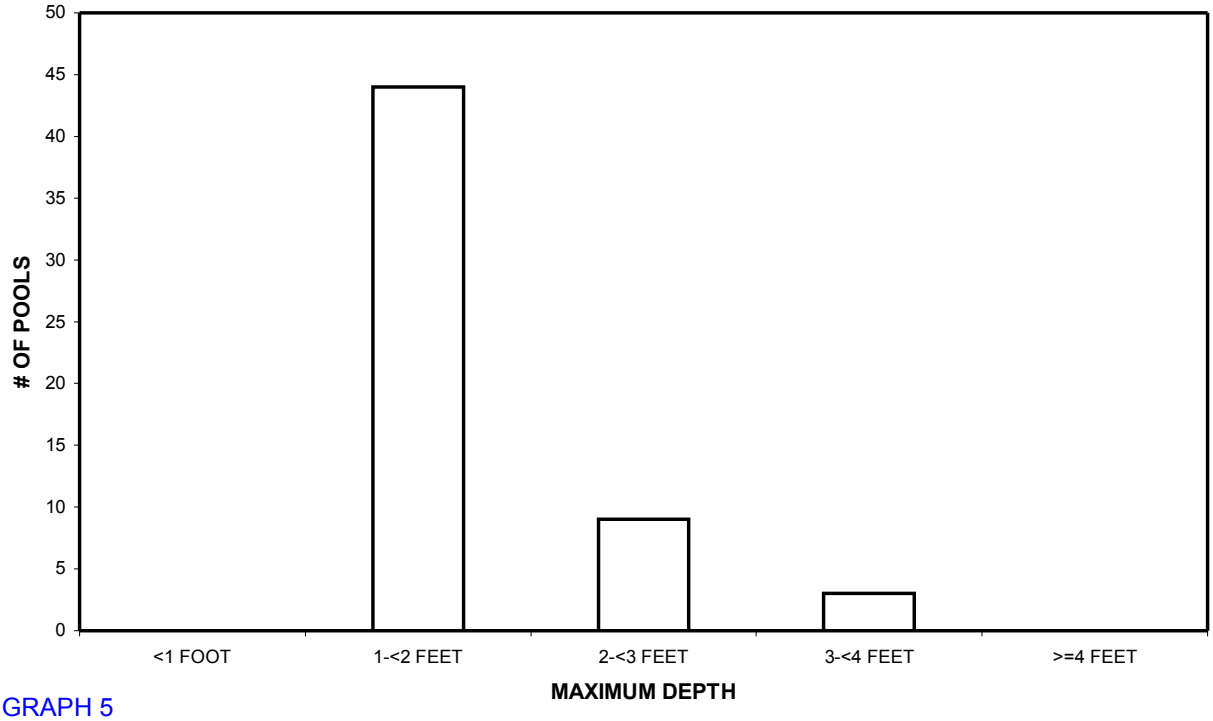
GRAPH 3

RIGHT BANK TRIBUTARY 1 MARTIN CREEK
POOL HABITAT TYPES BY PERCENT OCCURRENCE



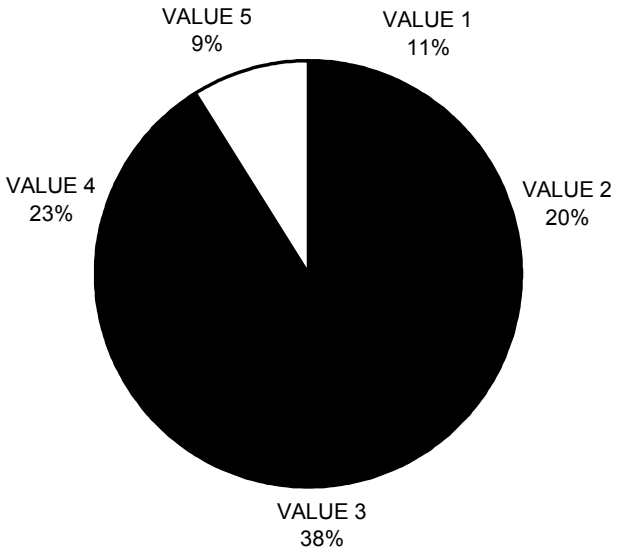
GRAPH 4

RIGHT BANK TRIBUTARY 1 MARTIN CREEK
MAXIMUM DEPTH IN POOLS



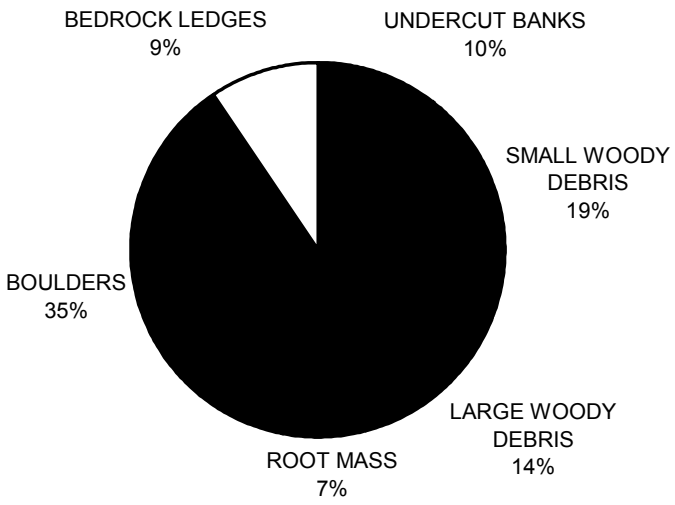
GRAPH 5

RIGHT BANK TRIBUTARY 1 MARTIN CREEK
PERCENT EMBEDDEDNESS



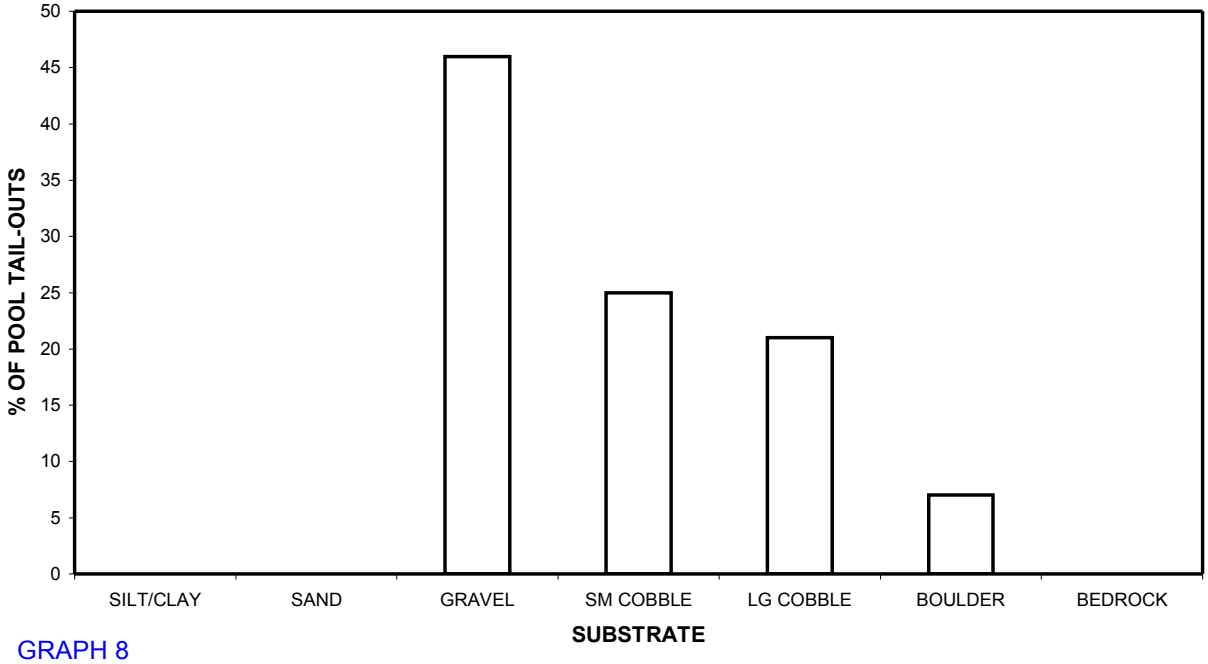
GRAPH 6

RIGHT BANK TRIBUTARY 1 MARTIN CREEK
MEAN PERCENT COVER TYPES IN POOLS



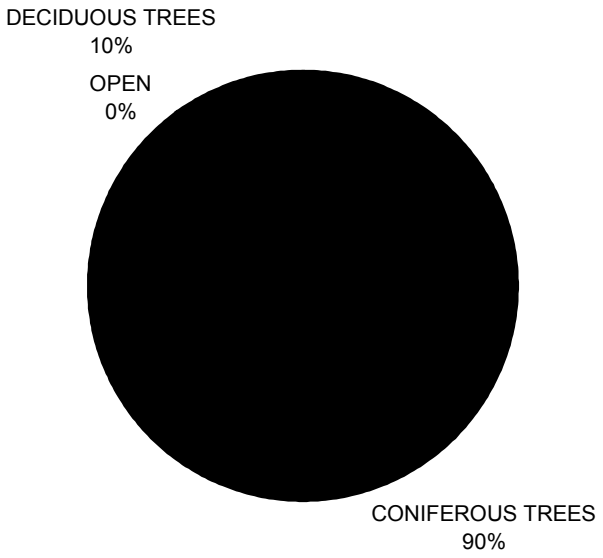
GRAPH 7

RIGHT BANK TRIBUTARY 1 MARTIN CREEK
SUBSTRATE COMPOSITION IN POOL TAIL-OUTS



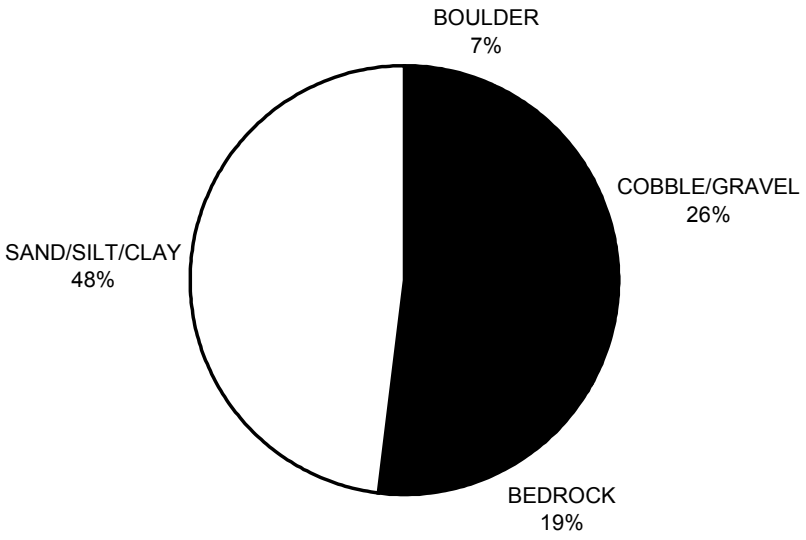
GRAPH 8

RIGHT BANK TRIBUTARY 1 MARTIN CREEK
MEAN PERCENT CANOPY



GRAPH 9

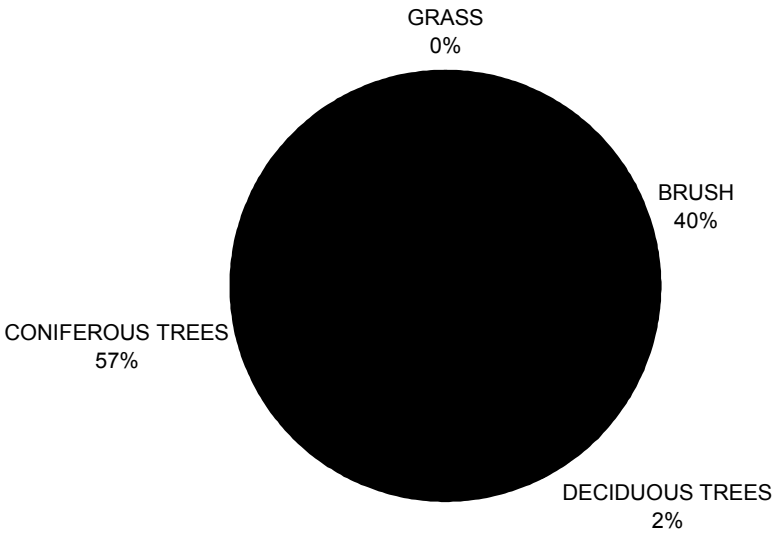
RIGHT BANK TRIBUTARY 1 MARTIN CREEK
DOMINANT BANK COMPOSITION IN SURVEY REACH



GRAPH 10

RIGHT BANK TRIBUTARY 1 MARTIN CREEK

DOMINANT BANK VEGETATION IN SURVEY REACH



GRAPH 11